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AN ANALYSIS OF CURRENT-PRACTICE, UNAIDED, TIME-STUDY RATINGS

A Thesis

Submitted to the Faculty

of

Purdue University

by

Arthur John Ela

In Partial Fulfillment of the

Requirements for the Degree

of

Master of Science

in

Industrial Engineering

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Thesis
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ABSTRACT

"...time study...may be defined as a procedure for determining the amount of time required, under certain standard conditions of measurement, for tasks involving some human activity."[1] One of the most important phases of a time study is that of rating the job pace or rate of activity. It is here that judgment on the part of the rater plays a major role. The major objective of this thesis is to examine the current state of time-study rating.

A group of seventy-two raters, nearly all active time study engineers, gathered at the 1950 Purdue Work Session, were the cross-section of the profession whose work furnished the basis for this study.

A series of eighteen films, three paces each of six different actual industrial jobs, were shown in entirely random order of pace and job. Each rater assigned ratings exactly as if the jobs were being performed in his own plant, according to his own company standard and company policies. These ratings were converted by him to a common, comparable, numerical basis to facilitate further analysis.

Previous to the showing of the films, personal data questionnaires were individually filled out, thus providing the necessary information for assembling the data according to various parameters.

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1. M. E. Mundel, Motion and Time Study Principles and Practices, New York, Prentice-Hall Inc., 1950, p. 1, (From Manuscript).

The data so obtained w~~as~~ere arranged and computations made in such a manner as to permit of analysis as to consistency, accuracy, and amount of variation. Also, it was desired to ascertain what outstanding differences, if any, might be found with regard to the following parameters: years experience, concept of standard, initial training, size of rater's own plant, geographic area, and size of city in which plant is located.

The ratings on each film were arrayed for the whole group and by each subdivision of the major parameters. Consistency is a measure of how the individual ratings are grouped about their arithmetic mean; accuracy, of how they are grouped about a least-squares corrected mean.

In order to carry out the other objectives, it became necessary to find an additional basis for comparison between the various parameter subdivisions, this basis to be capable of consolidation of much bulk into a few statistics that will submit to further analysis. Thus, for each array, limits were set up at the ±5%, ±7½%, ±10%, and the ±20% levels about the actual means to measure consistency, and similar limits were set about the corrected means to measure accuracy. Percentages of each array lying within each set of limits were then determined, becoming the figures for comparison.

For consistency of rating, within ±5% of the group mean we find an average of 38.2 percent or nearly two out of five, which increases to 64.9 percent, nearly 2 out 3,

within ±10%. The results for overall group accuracy are somewhat lower, ranging from 1 in 3 within ±5% to nearly 3 out of 5 within ±10% of the corrected mean.

The average range of the ratings of pace for the whole group, still based on 100 as standard, is found to be 77 - 154, exactly a 2 to 1 spread. The average rating to which such an average range applies is 113 percent of standard.

It is felt that this analysis of "current practice" time-study rating shows that the present state of time-study rating is not up to the level required for the wide-spread confidence and acceptance that is so necessary for its use. The need for time studies and their proven aid in solving many complex industrial problems have been demonstrated for many years. The need now is for more consistent, accurate, and reliable ratings of pace and their end product, more absolute, trustworthy, and authoritative standard times.

AN ANALYSIS OF CURRENT-PRACTICE, UNAIDED, TIME-STUDY RATINGS

INTRODUCTION

"...time study...may be defined as a procedure for determining the amount of time required, under certain standard conditions of measurement, for tasks involving some human activity."[1] The end result of a time study is the standard time for the job. One of the most common types of time study is the stop-watch time study, by far the most widely used aid in obtaining a standard time,[2] as defined by Mundel: "A stop-watch time study is used to find the amount of time that will be necessary to perform a unit of work, using a given method, under given conditions of work, by a worker possessing sufficient skill to perform the job properly, as physically fit for the job after adjustment to it as the average person who can be expected to be put on the job and working at a pace 100/130 of the maximum pace that can be maintained, day after day, without harmful physical effects."[3]

It is obvious that it would be mere chance to find a

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1. M. E. Mundel, Motion and Time Study Principles and Practices, New York, Prentice-Hall, Inc., 1950, p. 1, (from manuscript).

2. "How They Do It", Modern Management, Vol. 6, No. 4, May 1946, pp. 17-19.

3. M. E. Mundel, Systematic Motion and Time Study, New York, Prentice-Hall, Inc., 1947, p. 158.

worker satisfying all the above conditions and working at such a standard pace. The mechanics of comparing a given worker's pace to standard pace is called rating. It is here that the rater's judgment must play an important part as no precise, mathematical way of comparison has yet been successfully devised.[4, 5] This phase of time study, rating, should be the strongest link in the chain because its veracity and fairness must be apparent if the standard time so produced is to be accepted with trust and confidence by all concerned.

There are many systems of rating, nearly all relying entirely on judgment. How well this judgment is used, what basis it rests upon, and the manner in which it takes into account the various factors of skill, aptitude, and degree of exertion are extremely important quantities in making a consistent, reliable and fair rating. Many systems have evolved using an estimate of effort to which individual company fatigue, personal time, tool repair, etc. allowances are added.

The actual item which must be judged is pace or rate of activity. The standard rate of activity on a particular job is chosen as that pace desired to be maintained. There are many numerical designations of standard pace

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4. M. E. Mundel, Op. Cit., p. 155.

5. L. P. Alford and John R. Bangs, Production Handbook, New York, The Ronald Press Co., 1947, pp. 505-507.

such as 60, 78, 80, 100, 120, etc. Each has its own peculiar means of manipulation to assist in arriving at a standard time.

Just how well industry is accomplishing the task of rating is a primary factor in the entire success, acceptance, and use of time study. It is a matter of importance to management and labor alike. As one prominent trade unionist states it: "Thus the solution to the basic problem of the validity of existing time study practice lies at the very heart of satisfactory industrial relations."[6] Thus, in just one example of the uses of time study, management and labor bargaining collectively, such bargaining should not and must not rest on a chance basis of inaccurate and inept ratings and their attendant poorly allocated standard times. Similarly, the many other uses of time studies must not rest upon any insecure or wavering basis.

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6. William Gomberg, A Trade Union Analysis of Time Study, Chicago, Science Research Associates, 1948, p. 15.

OBJECTIVE AND PURPOSE

The objective of this thesis is to gather and array data on current practice time-study ratings in such a manner that will permit of analysis as to consistency, accuracy, and amount of variation. These three factors in the rating of job pace or rate of activity are extremely important necessities for the widespread acceptance of and confidence in time study work. Just how well does present practice of time study engineers deserve such confidence and acceptance? It is hoped that a partial, though limited, answer to this question may be found in this paper.

Many experienced time study engineers have stated that estimates of pace rarely vary more than five percent.[7] How reliable is this estimate of raters' abilities? Are management and labor justified in taking action based on such an estimate of consistency?

It was further desired to ascertain what outstanding differences, if any, might be found with regard to the following parameters: (1) years of experience of the rater; (2) concept of standard individually used; (3) type of training initially received; (4) size of rater's own plant; (5) geographic area in which the rater's plant is located; and (6) the size of town or city in which the individual rater's plant is located. Taking into account the region

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[7] Dale Yoder, Personnel Management and Industrial Relations, New York, Prentice-Hall, Inc., 1948, p. 143.

drawn upon, and in the hope of most logically uncovering the existence of or lack of any differences, the above parameters were subdivided as follows:

(1) Years Experience
    (A) less than six months
    (B) 6 months - 2 years
    (C) 2 - 4 years
    (D) more than 4 years

(2) Concept of Standard Used at Plant
    (A) your own concept of standard performance
    (B) some film or other embodiment of standard performance.

(3) Initial Time Study Training Received
    (A) Company
    (B) College

(4) Size of Plant
    (A) 0 - 200 employees
    (B) 200 - 1,000 employees
    (C) over 1,000 employees

(5) Plant Geographic Location
    (A) Northern Midwest (less Michigan)
    (B) Central Midwest
    (C) Southern Midwest
    (D) Michigan

(6) Size of City, Plant Located in

- (A) 0 - 5,000
- (B) 5 - 10 thousand
- (C) 10 - 25 thousand
- (D) 25 - 50 thousand
- (E) 50 - 100 thousand
- (F) over 100,000.

PROCEDURE A

PREPARATION FOR AND RECEIPT OF RATINGS

Six films were obtained from a large southern Indiana industrial concern. Each film consisted of several cycles at different paces of a particular, actual industrial job. After a careful check for spurious motions, constancy of pace, and of cycle times, three film loops were cut from each film. These eighteen film loops, each of exactly one cycle, became the jobs which were to be rated. No false experimental conditions are thus set up because previous research has shown that time study engineers can rate pace from films or by actually observing the worker with practically equal facility.[8] These jobs covered the range from simple finger, hand, and arm movements of light assembly and inspection to the gross body movements used in loading and operating a large forming press.

The next necessary component, the raters themselves, were the participants at the Fifth Annual Motion and Time Study Work Session (1950 session) held at this university. These seventy-two raters were from throughout the Middle West and nearly all were actively engaged time study engineers.

A short briefing of the assembled engineers was made prior to the showing of the films. It was emphasized that

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[8] M. E. Mundel and L. R. Margolin, Report of the Fourth Annual Motion and Time Study Work Session, Purdue Univ., 1949.

the various jobs and paces of these jobs were to be rated exactly as if they were occurring and being rated in the rater's own plant. Ratings were assigned according to the rater's own company standard and company policies and were then converted to a common, comparable, numerical basis by each individual rater. The common basis selected was the 100 standard-130 maximum non-harmful physical effort definition. The raters were furnished a simple, arithmetic conversion table to convert their own rating scale, no matter what standard, to this scale.

The work session was cautioned not to rate the method, to assume the method used the best for the particular job in question. No method variations were given on any of the jobs and the raters were told to assume that work of acceptable quality accompanied each of the eighteen performances.

The assemblage was further cautioned that although there were three paces each of six different actual industrial jobs, there was no set ratio between paces on the same or different jobs; and that the three paces of each job, themselves, might be practically the same or quite different.

Finally the films were shown, and in an entirely random order so that no set sequence of pace or job could possibly influence the raters. Although shown in random order, the films are numbered consecutively from one to eighteen in this paper, each three numbers in order

referring to the three paces of a particular job.

The information enabling the breakdown of the six major categories into their several subdivisions was obtained from personal data questionnaires filled out prior to the showing of the films.[9]

At this point it is desired to state that the manner in which the ratings were recorded and tabulated has much to do with the size and scope of the analyses of this work. Each rater placed his converted ratings on an IBM mark-sensing card which then later was punched and used to assist in tabulating the results. The facility with which the various ratings and parameters could be entered on these cards, the speed and accuracy of assembling all or any segment of the data by any particular parameter or subdivision, and the complete tabular arrays, all produced by the various IBM equipments are an outstanding addition to this type of research. Long, tedious hours of data assemblage and arraying became short minutes to the electronic "mind".

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9. Bernard S. Borrus, The Present State of Time Study, Thesis, Manuscript, Purdue Univ., June, 1950.

PROCEDURE B

ASSEMBLY AND COMPUTATION OF DATA

A logical division of the procedure occurs at this point. The first phase included the preparation for and the receipt of the "current practice" ratings of pace by the group of time study engineers. The second phase consists of the proper assemblage, manipulation, and computation of the data necessary to form the basis for any possible results and conclusions.

The individual ratings assigned to a particular film were next arrayed for the whole group (all 72 raters) and by the various subdivisions of the six parameters. For each array, the average or arithmetic mean was determined as the initial basis for comparison. Consistency, the analysis of which was one of the primary objectives, is the measure of how the individual ratings of a given array are grouped about its arithmetic mean.

However, to call this "average rating" the actual or true rating, even though it is the concensus of opinion of 72-odd professional time study men, would be an untenable assumption. Much previous information on the subject has determined a general tendency to rate the slower paces too high and the more rapid paces too low.[10] Therefore, a corrected mean, or rather, a best available approximation

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[10] M. E. Mundel and L. R. Margolin, Report of the Fourth Annual Motion and Time Study Work Session, Purdue Univ., 1949.

of the correct mean rating, was computed with the aid of a precise knowledge of the ratios between cycle times for each of the three paces on a given job. A consistent series based on the actual cycle times for each pace was obtained for each of the six different jobs. The consistent series was adjusted by a single factor so that when this series and the averages of the individual ratings in each array on each job were then plotted, the sums of the squares of their deviations about Y=X were a minimum. A value, so obtained, thus becomes the best approximation of the correct mean rating, hereafter referred to as the corrected mean. Accuracy, whose analysis was another primary objective, is the measure of how the individual ratings of an array are grouped about its corrected mean.

It is apparent that the term "array" has assumed an ever-increasing importance in this paper, reoccurring most frequently. To yield a clearer picture of what is referred to when this word appears, the following is offered in explanation. The ratings for a particular pace by a particular subdivision of a parameter, such as "2 - 4 years" of "Years Experience", are arranged from lowest to highest. This is an array. For each array the range, lowest subtracted from the highest rating; the arithmetic mean, the corrected mean, and various groupings about these means may be easily computed. The importance of arrays in this work may be further emphasized by the quick calculation that, having eighteen paces and twenty-two subdivisions of

parameters, a resultant 396 arrays must necessarily be arranged and manipulated.

In order to carry out the other objectives, it becomes necessary to find an additional basis for comparison between the various parameter subdivisions. This basis to be capable of consolidation of much bulk into a few statistics that will submit to further analysis. Thus, for each array, limits were set up at the ±5%, ±7½%, ±10%, and the ±20% levels about the actual means to indicate comparative consistency of rating, and similar limits were set about the corrected means for an indication of comparative accuracy. Percentages of each array lying within each set of limits were then determined and are tabulated in the various Tables in the Appendix. The average percentage for each group also appears.

Reference to any of the Tables mentioned above will show quite wide variations in percentages between the various subdivisions of a parameter. The next step was to determine if any statistically significant differences actually existed. A standard F test was made for significant differences at either the 5 or 1 percent confidence levels between means within a parameter. For those that indicated a difference in means greater than could be expected by chance alone, Fisher t tests between all combinations of pairs within a parameter were made. Results of the t test at the 5% level indicated a reasonable doubt that the differences between two means could be due to

chance alone; while results at the 1% level indicated quite probably, i.e., 99 times out of 100, that the differences were due to some factor other than chance. The results of both the F and t tests appear in Tables 24 and 25 respectively.

RESULTS

Probably the most important results appear in Tables 1 and 2 of the Appendix. These portray the various findings for the work session taken as a whole. For consistency of rating, within ±5% of the group mean we find an average of 38.2 percent, or nearly two out of five, which increases to 64.9 percent, nearly 2 out of 3, within ±10%. The results for overall group accuracy are somewhat lower, ranging from 1 in 3 within the ±5% limits to nearly 3 out of 5 within ±10% of the corrected mean.

The average range of the ratings of pace for the whole group, still based on 100 as standard, appears in Table 2 as 77 - 154, exactly a 2 to 1 spread. The average rating to which such an average range applies is 113 percent.

Also found in Table 2 are the eighteen arithmetic and corrected means and the variations between each, ranging from 0 on film 15 to 12.9% on film 9, showing an average variation of 6.2%.

Tables 3 through 23 show the percentages within the limits of their respective means for the various subdivisions of the six parameters. From these tables, with the aid of Tables 24 and 25, the following statistically significant differences between means are found:

Initial Training. Between "Company" and "College" for both consistency and accuracy.

Area. Between Michigan and all other groups in consistency only.

Size of City. Between over 100,000 and all other groups in consistency only.

Between 5 - 10,000 and all groups but 0 - 5,000 in consistency.

Between 0 - 5,000 and 25 - 50,000 in consistency.

Because of the industry, attitude, and whole-hearted cooperation of the members of the 1950 work session, it is believed that the results and data compiled in this thesis are probably representative of time study practice in the Middle West area.

CONCLUSIONS

1. The premise that time study engineers' ratings of pace rarely vary more than 5 percent is not borne out. Only 38.2 percent of the work session were within ±5%, and no subdivision had more than 56.7 percent within these limits of its mean.

2. The average range of 77 - 154 on an average pace of 113 percent appears excessive in that all raters were viewing the same films at the same time. However, it should be pointed out that 89.7 percent of the whole group were within ±20%, yielding a range of 90 - 135 (about 113) in which 9 out of 10 raters are found.

3. The group as a whole exhibited a marked tendency to rate the faster paces more consistently than the slower. On the slowest pace shown (film 4 - 97 percent) only 17 percent of the work session participants were within ±5% of the mean rating, while on a typical faster pace shown (film 12 - 134 percent) a total of 53 percent were within ±5% of the mean. This effect continued with only 48 percent of the group within ±10% of the mean rating on the slowest while 81 percent were within these limits of the mean rating on the faster pace.

4. Throughout the analysis, accuracy, or grouping about the best available estimate of the correct pace, was slightly inferior to consistency (the grouping with respect to the arithmetic mean pace).

5. Also apparent in the many arrays is the previously mentioned "regression" tendency to rate the lower paces too high and the higher paces too low.

6. No significant differences at the 5% confidence level between the various subdivisions of the EXPERIENCE, CONCEPT OF STANDARD, and NUMBER OF EMPLOYEES categories is found. However, it is desired to point out that a comparison of Tables 7 and 8 will show that the raters having a "Film or other embodiment of standard" concept are both more consistent and more accurate within all rating error limit groups, having percentage pluralities ranging up to 11 percent.

7. Significant differences between means existed at the 5% confidence level (1 time) and at the 1% level (5 times) for consistency between "Company" and "College" under category INITIAL TRAINING (see Table 25). In each instance "College" is lower than "Company" when comparing actual percentage means. It is not believed that the inference that receiving initial time study training in college is inferior to company initial training can be sustained from this one category breakdown analysis, but rather that the possible interaction of other parameters such as years of experience, size of group, etc. have played an important part in yielding these results.

8. Under the AREA parameter, significant differences at the 1% confidence level were found between "Michigan" and all other subdivisions for all groupings. Reference

to the tables of actual percentage means shows "Michigan" possessing markedly lower averages throughout. However, the results here are not an indictment of the whole "Michigan" area as the sample size of only nine men is very small and two of this subgroup assigned extremely high ratings throughout the entire eighteen films.

9. Under SIZE OF CITY the raters from "Over 100,000" are significantly and consistently below all other groups. Likewise are the "5 - 10,000" raters below nearly all others. Again, it is believed that probably the extremely small sample sizes of these two groups and the interaction of other factors preclude the definite conclusion that inferior ratings correlate with such sizes of cities.

INFERENCES

1. It is felt that this analysis of "current practice" time-study rating shows that the present state of time-study rating is not up to the level required for the widespread confidence and acceptance that is so necessary for its use. The need for time studies and their proven aid in solving many complex industrial problems have been demonstrated for many years. The need now is for more consistent, accurate, and reliable ratings of pace and their end product, more absolute, trustworthy, and authoritative standard times.

2. Perhaps the single most important inference that can be gained from this analysis is that there exists an urgent need for removing or minimizing the personal "judgment" factor from the individual rating. The wide ranges of ratings when viewing the same rates of activity must be lessened if we are to achieve more consistent ratings.

The use of different concepts of standard pace and the reliance on personal judgment must be minimized. In other words, a more concrete basis must be found for the rating procedure. It is believed that the exception noted under Specific Conclusion 6, while not conclusive in itself, points the way to possible ultimate reduction to insignificance of the judgment factor. It is suggested that the use of a film showing a standard rate of activity or various percentages thereof, shown adjacent to or

superimposed upon a film of the pace desired to be rated can result in much more consistent, accurate, and reliable ratings of pace by giving the rater a visible, concrete basis on which to exercise the then modicum of personal judgment required. While this procedure may not be economically feasible for the making of all job pace ratings, a judicious use of such a procedure should, in all probabilities, result in a definite minimizing of the judgment factor.

APPENDIX

Table 1

ENTIRE GROUP - 72 RATERS

Consistency

Film No.	Arithmetic Mean Rating	Percent of Group Within ±5%	±7½%	±10%	±20%
1	111	29	51	58	87
2	112	41	57	71	88
3	110	38	51	60	88
4	97	18	35	48	84
5	113	32	38	54	88
6	136	51	62	76	93
7	101	31	43	59	90
8	107	41	50	65	88
9	101	25	38	47	78
10	110	40	51	59	91
11	118	35	56	65	94
12	134	53	65	81	93
13	116	40	60	68	93
14	113	44	53	68	90
15	114	43	51	68	94
16	112	35	64	74	90
17	117	40	61	69	93
18	117	51	72	78	93
	Average	38.2	53.2	64.9	89.7

Accuracy

Film No.	Corrected Mean Rating	Percent of Group Within ±5%	±7½%	±10%	±20%
1	104	29	43	53	82
2	105	37	50	57	85
3	122	19	34	47	76
4	87	26	32	44	72
5	109	35	47	57	90
6	144	39	51	69	87
7	90	22	32	44	63
8	101	25	40	54	85
9	116	12	24	36	64
10	104	29	49	57	88
11	112	35	54	67	89
12	143	29	40	65	94
13	108	28	39	57	92
14	120	44	50	60	88
15	114	43	51	68	94
16	107	47	58	68	87
17	115	44	56	68	93
18	115	53	68	82	94
	Average	33.1	45.4	58.5	84.6

Table 2

COMPARISON OF ENTIRE GROUP MEANS AND RANGE

Film No.	Range	Arithmetic Mean Rating	Corrected Mean Rating	Percent Variation
1	65 - 156	111	104	6.7
2	70 - 149	112	105	6.7
3	65 - 151	110	102	9.8
4	62 - 143	97	87	11.5
5	75 - 162	113	109	3.7
6	85 - 169	136	144	5.5
7	50 - 143	101	90	12.2
8	65 - 149	107	101	5.9
9	75 - 143	101	116	12.9
10	78 - 151	110	104	5.8
11	87 - 156	118	112	5.4
12	102 - 175	134	143	6.3
13	81 - 151	115	108	7.4
14	78 - 162	113	120	5.8
15	88 - 151	114	114	0
16	76 - 149	112	107	4.7
17	87 - 156	117	115	1.7
18	92 - 156	117	115	1.7
Average	77 - 154	113	111	6.2

Table 3

EXPERIENCE
LESS THAN 6 MONTHS - 6 RATERS

Consistency

Film No.	Arithmetic Mean Rating	Percent of Group Within ±5%	±7½%	±10%	±20%
1	107	33	67	67	100
2	114	33	67	67	67
3	107	33	50	50	83
4	100	0	0	0	50
5	115	17	17	50	83
6	128	17	50	67	83
7	97	33	33	50	83
8	106	33	50	50	83
9	92	50	50	67	100
10	113	17	17	17	100
11	109	50	83	100	100
12	131	17	33	67	100
13	110	33	50	67	100
14	108	33	67	83	100
15	116	50	50	67	100
16	113	33	67	67	100
17	114	67	67	67	100
18	114	50	67	83	100
	Average	33.3	49.2	60.3	90.7

Accuracy

Film No.	Corrected Mean Rating	Percent of Group Within ±5%	±7½%	±10%	±20%
1	102	50	67	67	83
2	104	17	33	33	67
3	120	17	33	50	83
4	67	17	17	33	50
5	108	33	33	33	100
6	142	50	50	67	83
7	85	0	0	0	33
8	95	17	17	17	67
9	110	17	17	33	83
10	101	17	33	33	50
11	109	50	83	100	100
12	140	33	33	50	83
13	106	33	67	83	83
14	117	50	67	67	83
15	111	33	50	50	100
16	106	33	33	33	83
17	114	67	67	67	100
18	114	50	67	83	100
	Average	32.4	42.6	50.0	79.5

Table 4

EXPERIENCE
6 MONTHS - 2 YEARS - 16 RATERS

Consistency

Film No.	Arithmetic Mean Rating	Percent of Group Within ±5%	±7½%	±10%	±20%
1	112	44	75	75	94
2	114	44	56	81	94
3	111	37	56	63	94
4	98	19	31	50	94
5	118	25	31	69	94
6	138	50	69	69	88
7	104	25	63	69	88
8	109	44	56	63	94
9	101	25	38	50	88
10	112	25	31	50	88
11	117	38	69	69	94
12	137	44	56	81	94
13	116	25	63	63	94
14	115	31	44	63	88
15	115	56	56	81	88
16	113	31	44	63	100
17	117	25	50	50	94
18	116	50	63	75	94
	Average	35.4	52.8	65.8	92.7

Average

Film No.	Corrected Mean Rating	Percent of Group Within ±5%	±7½%	±10%	±20%
1	105	50	63	63	94
2	107	37	50	56	94
3	123	19	37	50	81
4	89	31	50	56	81
5	112	50	56	63	88
6	148	44	56	63	88
7	91	25	38	44	69
8	102	13	31	56	88
9	117	6	25	31	63
10	105	25	50	56	88
11	113	44	56	75	94
12	145	19	44	63	100
13	109	13	31	50	83
14	121	38	56	56	83
15	115	56	56	81	100
16	107	31	63	69	83
17	115	31	38	50	100
18	115	56	63	75	100
	Average	32.7	47.9	58.7	88.1

Table 5

EXPERIENCE
2 YEARS - 4 YEARS - 19 RATERS

Consistency

Film No.	Arithmetic Mean Rating	Percent of Group Within ±5%	±7½%	±10%	±20%
1	111	42	47	47	63
2	113	50	50	88	94
3	109	44	69	69	100
4	96	19	19	25	75
5	111	25	50	56	100
6	136	68	68	84	100
7	100	19	25	56	88
8	104	25	56	81	88
9	106	32	37	58	90
10	108	50	56	81	100
11	120	47	47	63	100
12	134	74	79	100	100
13	116	53	68	84	100
14	112	50	75	81	100
15	109	38	44	50	100
16	110	74	84	90	95
17	118	47	74	95	100
18	118	53	79	84	95
	Average	45.0	57.1	71.8	93.7

Accuracy

Film No.	Corrected Mean Rating	Percent of Group Within ±5%	±7½%	±10%	±20%
1	104	42	47	47	68
2	106	37	50	63	88
3	122	19	44	63	81
4	87	6	6	19	56
5	109	38	44	56	100
6	143	42	47	84	100
7	90	25	25	31	50
8	101	25	38	63	94
9	116	26	26	53	79
10	104	44	63	75	100
11	112	26	42	53	84
12	144	21	42	90	100
13	107	38	42	58	90
14	118	50	69	75	100
15	112	31	44	56	100
16	107	63	74	90	95
17	116	58	68	84	100
18	116	42	84	90	95
	Average	35.2	47.5	63.9	87.8

Table 6

EXPERIENCE
MORE THAN 4 YEARS - 29 RATERS

Consistency

Film No.	Arithmetic Mean Rating	Percent of Group Within ±5%	±7½%	±10%	±20%
1	109	31	41	52	90
2	109	54	61	82	96
3	106	39	50	57	93
4	93	43	54	61	93
5	108	32	46	61	89
6	133	45	55	76	93
7	100	32	54	57	93
8	106	39	50	68	93
9	98	24	31	55	83
10	107	36	57	71	93
11	115	35	55	79	90
12	132	62	69	72	90
13	115	52	55	69	97
14	111	39	46	68	89
15	114	43	54	71	96
16	110	45	62	69	93
17	116	48	69	72	86
18	116	59	72	83	93
	Average	42.1	54.5	68.0	91.7

Accuracy

Film No.	Corrected Mean Rating	Percent of Group Within ±5%	±7½%	±10%	±20%
1	101	24	34	45	72
2	103	46	61	64	89
3	119	21	43	46	79
4	84	29	39	54	79
5	106	32	50	64	89
6	139	45	62	72	93
7	88	21	36	46	68
8	99	32	36	54	86
9	114	7	21	35	59
10	102	25	39	50	93
11	110	52	59	66	86
12	140	35	52	66	90
13	107	31	45	59	79
14	119	46	57	64	82
15	113	32	46	64	96
16	106	45	52	55	86
17	114	38	62	72	90
18	114	62	76	76	97
	Average	34.6	48.3	58.4	84.0

Table 7

CONCEPT OF STANDARD
OWN CONCEPT - 54 RATERS

Consistency

Film No.	Arithmetic Mean Rating	Percent of Group Within ±5%	±7½%	±10%	±20%
1	110	50	56	61	89
2	113	46	50	84	90
3	109	36	54	60	92
4	96	24	30	42	76
5	112	42	44	58	92
6	134	44	56	70	93
7	102	32	56	60	90
8	107	40	46	68	90
9	101	30	41	52	85
10	110	38	50	58	90
11	117	32	61	72	93
12	134	46	63	82	94
13	115	41	61	72	96
14	112	40	54	66	90
15	114	38	46	60	94
16	111	57	74	78	93
17	117	39	63	72	91
18	117	54	74	80	96
	Average	40.5	54.4	66.4	90.8

Accuracy

Film No.	Corrected Mean Rating	Percent of Group Within ±5%	±7½%	±10%	±20%
1	103	26	41	48	87
2	105	40	54	58	86
3	122	24	30	48	82
4	86	20	32	44	68
5	108	32	48	64	92
6	143	41	46	72	91
7	89	16	28	46	66
8	100	28	36	56	86
9	115	13	22	39	70
10	103	28	48	58	88
11	112	43	52	67	91
12	143	26	41	65	96
13	108	32	39	56	83
14	119	46	60	68	88
15	113	30	44	54	94
16	107	46	59	74	87
17	115	44	56	70	93
18	115	50	72	78	96
	Average	32.5	44.9	59.2	85.8

Table 8

CONCEPT OF STANDARD
FILM OR OTHER EMBODIMENT - 15 RATERS

Consistency

Film No.	Arithmetic Mean Rating	Percent of Group Within ±5%	±7½%	±10%	±20%
1	112	7	47	53	100
2	107	33	53	73	100
3	109	47	53	73	100
4	96	27	53	67	100
5	111	20	47	60	100
6	138	60	80	100	100
7	101	7	40	60	100
8	107	53	60	67	100
9	100	27	80	47	93
10	109	53	60	73	93
11	115	33	53	73	100
12	134	67	80	93	100
13	114	60	67	80	100
14	113	53	80	100	100
15	112	60	93	93	100
16	112	27	60	80	100
17	115	53	67	73	100
18	114	73	80	100	100
	Average	42.2	61.8	75.8	99.2

Accuracy

Film No.	Corrected Mean Rating	Percent of Group Within ±5%	±7½%	±10%	±20%
1	102	53	53	60	67
2	104	33	47	67	100
3	120	13	53	60	93
4	87	40	40	47	80
5	110	47	47	60	100
6	144	53	73	93	100
7	89	33	47	47	53
8	100	20	53	67	93
9	115	20	27	47	67
10	103	47	53	60	87
11	111	27	53	60	87
12	142	53	53	80	100
13	107	20	40	53	93
14	118	60	60	73	100
15	112	60	93	93	100
16	106	53	67	67	93
17	114	53	67	73	100
18	114	73	80	100	100
	Average	42.1	55.9	67.1	89.6

Table 9

INITIAL TRAINING
BY COMPANY - 45 RATERS

Consistency

Film No.	Arithmetic Mean Rating	Percent of Group Within			
		±5%	±7½%	±10%	±20%
1	112	29	51	58	89
2	114	51	76	85	90
3	110	44	61	73	95
4	97	22	37	44	88
5	113	37	46	63	93
6	134	58	73	89	96
7	103	27	49	56	90
8	109	56	68	78	90
9	103	20	40	49	89
10	112	44	63	63	93
11	118	38	58	71	98
12	135	53	67	84	96
13	109	47	71	87	98
14	121	54	61	78	93
15	115	46	56	78	95
16	112	44	78	84	93
17	118	47	73	87	98
18	118	58	82	84	93
	Average	43.0	61.6	72.8	93.1

Accuracy

Film No.	Corrected Mean Rating	Percent of Group Within			
		±5%	±7½%	±10%	±20%
1	105	45	47	60	82
2	107	41	54	66	90
3	127	20	32	49	90
4	87	22	29	39	68
5	109	37	51	63	93
6	143	44	51	76	96
7	91	27	49	56	90
8	102	32	68	78	90
9	118	16	40	49	89
10	105	32	51	66	90
11	113	42	49	69	93
12	144	20	38	67	98
13	118	38	58	69	93
14	114	34	54	63	98
15	115	46	56	68	95
16	108	56	64	78	93
17	116	60	71	80	93
18	116	56	82	89	93
	Average	43.0	52.4	66.3	90.7

Table 10

INITIAL TRAINING
IN COLLEGE - 22 RATERS

Consistency

Film No.	Arithmetic Mean Rating	Percent of Group Within			
		±5%	±7½%	±10%	±20%
1	111	45	45	68	91
2	111	32	45	41	82
3	111	41	41	45	82
4	98	18	32	50	62
5	116	9	32	45	82
6	142	45	64	73	82
7	101	36	50	59	91
8	106	27	41	55	86
9	99	32	32	64	86
10	110	32	41	50	91
11	118	32	55	55	86
12	136	45	68	77	91
13	115	23	32	50	86
14	114	55	59	68	91
15	115	41	45	64	91
16	113	32	36	55	86
17	117	32	45	68	91
18	116	45	59	64	95
	Average	34.5	45.6	58.3	87.1

Accuracy

Film No.	Corrected Mean Rating	Percent of Group Within			
		±5%	±7½%	±10%	±20%
1	104	36	36	50	82
2	106	36	45	45	73
3	122	18	41	50	73
4	89	23	36	45	77
5	113	27	41	45	82
6	149	41	55	55	82
7	89	14	32	45	64
8	106	27	41	55	86
9	114	18	18	36	64
10	104	32	36	50	91
11	112	23	50	59	82
12	144	27	50	64	91
13	109	18	36	50	86
14	120	55	64	73	77
15	114	44	45	68	91
16	107	32	45	55	77
17	115	27	41	50	91
18	115	45	55	73	95
	Average	30.0	39.8	53.7	81.2

Table 11

NUMBER OF EMPLOYEES
0 - 200 - 10 RATERS

Consistency

Film No.	Arithmetic Mean Rating	Percent of Group Within ±5%	±7½%	±10%	±20%
1	102	80	90	90	100
2	104	10	30	30	80
3	103	10	50	60	90
4	83	40	70	90	90
5	102	40	60	80	100
6	126	40	50	70	90
7	92	30	40	40	80
8	101	10	30	60	80
9	91	40	50	50	90
10	97	50	70	80	100
11	108	30	50	90	100
12	128	60	80	80	100
13	110	40	70	90	100
14	108	30	70	80	100
15	107	40	40	60	100
16	107	50	70	80	90
17	109	20	40	60	100
18	113	40	50	90	100
	Average	36.7	56.1	71.1	93.9

Accuracy

Film No.	Corrected Mean Rating	Percent of Group Within ±5%	±7½%	±10%	±20%
1	96	20	20	80	100
2	98	20	30	30	80
3	113	50	50	60	90
4	79	60	80	90	90
5	99	30	40	80	100
6	130	20	50	70	90
7	82	10	30	50	50
8	92	30	30	30	80
9	106	20	20	40	70
10	96	50	70	80	90
11	104	30	70	70	100
12	133	60	80	90	100
13	103	50	60	60	100
14	114	40	50	60	100
15	108	40	50	60	100
16	102	50	60	70	100
17	110	20	40	70	100
18	110	50	60	70	100
	Average	36.1	50.0	64.4	90.6

Table 12

NUMBER OF EMPLOYEES
200 - 1,000 - 37 RATERS

Consistency

Film No.	Arithmetic Mean Rating	Percent of Group Within ±5%	±7½%	±10%	±20%
1	111	41	52	57	84
2	114	43	63	77	89
3	111	28	46	63	86
4	98	26	34	46	83
5	114	37	46	54	86
6	135	57	65	76	93
7	103	23	51	57	89
8	108	43	51	71	92
9	101	24	35	44	79
10	112	43	54	63	92
11	118	33	54	71	95
12	135	44	54	79	90
13	116	52	71	74	95
14	113	37	60	66	86
15	115	43	49	71	66
16	112	35	54	65	93
17	118	41	68	84	90
18	117	52	76	82	93
	Average	39.0	54.6	66.7	87.8

Accuracy

Film No.	Corrected Mean Rating	Percent of Group Within ±5%	±7½%	±10%	±20%
1	104	13	35	49	84
2	106	40	57	60	86
3	123	28	40	43	83
4	87	17	26	37	71
5	110	31	40	46	86
6	144	41	57	71	87
7	90	17	31	43	54
8	101	26	40	54	86
9	116	9	22	33	68
10	105	28	43	60	92
11	113	44	63	61	90
12	144	24	41	46	90
13	109	30	52	65	90
14	120	46	51	63	89
15	114	43	49	69	94
16	108	35	49	57	90
17	116	49	68	74	90
18	116	57	76	84	90
	Average	32.1	46.7	57.0	84.4

Table 13

NUMBER OF EMPLOYEES
MORE THAN 1,000 - 21 RATERS

Consistency

Film No.	Arithmetic Mean Rating	Percent of Group Within ±5%	±7½%	±10%	±20%
1	111	19	48	62	100
2	110	53	58	68	100
3	106	37	68	74	95
4	96	32	58	68	100
5	111	37	63	63	100
6	137	67	71	91	100
7	99	58	63	79	100
8	106	47	58	68	100
9	103	38	43	48	95
10	110	58	74	74	95
11	117	43	62	67	95
12	132	81	86	95	100
13	114	33	38	57	100
14	111	47	79	79	95
15	112	58	74	74	90
16	111	48	62	81	95
17	116	52	67	71	100
18	115	57	76	86	95
	Average	48.1	63.8	72.5	97.5

Accuracy

Film No.	Corrected Mean Rating	Percent of Group Within ±5%	±7½%	±10%	±20%
1	102	43	43	48	71
2	104	42	53	68	100
3	120	21	32	47	84
4	87	47	47	53	84
5	109	63	63	79	100
6	143	48	57	86	100
7	89	21	37	58	79
8	100	37	63	68	95
9	115	14	33	57	71
10	103	37	47	63	84
11	111	24	52	67	90
12	142	43	43	81	100
13	107	24	38	48	81
14	118	47	53	74	90
15	112	58	74	74	90
16	106	52	67	76	90
17	114	48	57	67	100
18	114	57	76	86	95
	Average	40.3	51.9	66.7	89.2

Table 14

AREA
NORTHERN MIDWEST (Less MICHIGAN) - 20 RATERS

Consistency

Film No.	Arithmetic Mean Rating	Percent of Group Within ±5%	±7½%	±10%	±20%
1	108	35	60	80	85
2	110	45	55	65	85
3	108	45	60	70	90
4	91	25	40	50	85
5	110	45	55	65	95
6	132	35	55	70	85
7	94	35	40	50	75
8	105	40	50	55	75
9	103	20	55	65	85
10	106	25	35	70	90
11	118	55	65	75	95
12	134	45	60	70	90
13	116	35	75	80	95
14	117	45	55	65	95
15	117	45	60	70	100
16	113	40	50	75	95
17	118	50	75	80	100
18	117	65	75	80	100
	Average	40.6	56.7	68.6	90.0

Accuracy

Film No.	Corrected Mean Rating	Percent of Group Within ±5%	±7½%	±10%	±20%
1	101	30	35	45	95
2	103	30	40	50	80
3	119	25	45	50	85
4	84	15	35	50	75
5	106	25	40	75	95
6	139	45	55	70	85
7	88	15	15	40	65
8	99	15	20	25	70
9	113	20	25	40	80
10	103	15	45	50	90
11	111	30	45	65	90
12	142	35	45	60	90
13	111	35	40	65	95
14	123	40	75	80	95
15	116	40	60	70	100
16	108	45	60	70	90
17	116	50	70	85	100
18	116	60	75	80	100
	Average	31.7	45.8	59.4	87.7

Table 15

AREA
CENTRAL MIDWEST - 31 RATERS

Consistency

Film No.	Arithmetic Mean Rating	Percent of Group Within ±5%	±7½%	±10%	±20%
1	109	42	52	55	94
2	110	59	59	63	96
3	105	34	44	52	96
4	96	30	30	44	89
5	108	37	48	59	81
6	132	55	68	74	100
7	104	26	59	63	100
8	107	33	45	70	100
9	101	24	26	42	77
10	108	26	41	63	96
11	115	42	52	71	97
12	131	65	78	84	97
13	113	42	52	61	97
14	108	33	41	67	93
15	111	48	63	63	100
16	108	35	39	45	55
17	113	35	39	52	97
18	113	42	58	90	100
	Average	39.3	49.7	62.1	92.5

Accuracy

Film No.	Corrected Mean Rating	Percent of Group Within ±5%	±7½%	±10%	±20%
1	101	35	45	58	71
2	102	37	52	59	96
3	118	37	48	52	85
4	85	19	26	41	67
5	106	41	48	63	85
6	140	48	74	81	97
7	90	22	26	33	55
8	101	19	37	52	96
9	116	19	29	45	58
10	102	41	48	56	82
11	110	39	52	71	87
12	140	35	65	78	97
13	105	32	42	42	81
14	116	41	56	70	85
15	110	41	63	70	100
16	103	23	29	35	52
17	111	35	35	48	97
18	111	48	58	68	100
	Average	34.0	46.3	56.2	82.8

Table 16

AREA
SOUTHERN MIDWEST - 12 RATERS

Consistency

Film No.	Arithmetic Mean Rating	Percent of Group Within ±5%	±7½%	±10%	±20%
1	115	25	25	58	92
2	113	50	50	67	92
3	115	50	58	58	92
4	101	33	42	42	75
5	116	8	25	42	92
6	145	42	75	75	92
7	102	8	25	33	92
8	108	50	58	75	92
9	99	17	17	33	75
10	113	25	25	75	92
11	119	33	33	42	92
12	136	58	83	83	100
13	118	33	53	75	92
14	116	67	83	83	83
15	115	42	42	67	92
16	115	42	50	83	92
17	121	50	83	83	100
18	121	25	67	75	100
	Average	36.6	50.0	63.8	91.0

Accuracy

Film No.	Corrected Mean Rating	Percent of Group Within ±5%	±7½%	±10%	±20%
1	107	25	50	50	75
2	109	50	58	67	92
3	126	17	17	42	83
4	92	33	42	42	83
5	115	17	17	42	92
6	152	42	42	58	100
7	90	42	42	58	67
8	100	42	67	75	92
9	115	0	17	33	50
10	106	67	67	75	92
11	114	33	33	75	83
12	146	17	42	42	100
13	110	25	33	50	92
14	122	25	58	75	83
15	116	33	50	67	92
16	111	42	67	75	83
17	119	67	67	92	100
18	119	58	67	75	100
	Average	35.3	46.4	60.7	86.6

Table 17

AREA
MICHIGAN - 9 RATERS

Consistency

Film No.	Arithmetic Mean Rating	Percent of Group Within			
		±5%	±7½%	±10%	±20%
1	120	22	22	44	89
2	127	22	44	56	100
3	119	11	22	44	78
4	108	0	11	44	78
5	129	11	33	44	100
6	141	22	44	56	89
7	108	22	22	44	78
8	113	33	44	56	67
9	101	22	56	56	78
10	121	33	56	56	67
11	121	44	44	44	89
12	145	22	44	44	100
13	120	22	33	56	100
14	115	33	56	56	67
15	117	44	56	56	67
16	119	44	44	56	89
17	124	22	56	56	89
18	126	22	22	33	78
	Average	25.1	39.4	50.0	83.5

Accuracy

Film No.	Corrected Mean Rating	Percent of Group Within			
		±5%	±7½%	±10%	±20%
1	114	33	44	44	78
2	116	22	67	67	78
3	134	11	44	44	67
4	95	22	33	33	56
5	119	11	11	56	78
6	157	22	22	33	78
7	93	56	56	56	78
8	105	44	67	67	78
9	120	11	11	11	44
10	111	33	33	56	78
11	120	44	44	44	89
12	153	22	22	33	100
13	111	44	44	44	78
14	123	22	33	33	89
15	117	44	56	56	67
16	113	22	44	56	89
17	121	33	56	56	89
18	121	33	44	44	67
	Average	29.4	40.6	46.3	76.7

Table 18

SIZE OF CITY
0 - 5,000 - 17 RATERS

Consistency

Film No.	Arithmetic Mean Rating	Percent of Group Within ±5%	±7½%	±10%	±20%
1	112	35	59	59	94
2	100	65	71	77	88
3	109	53	65	82	94
4	94	41	41	47	94
5	106	24	41	53	94
6	136	53	77	88	94
7	100	24	29	65	94
8	105	47	59	65	88
9	97	29	53	65	82
10	108	29	47	59	100
11	116	29	53	65	100
12	135	41	53	77	100
13	115	71	71	88	100
14	112	47	71	71	100
15	112	29	59	65	100
16	111	59	71	82	100
17	116	47	65	77	100
18	115	71	71	82	100
	Average	44.1	58.7	70.4	95.7

Accuracy

Film No.	Corrected Mean Rating	Percent of Group Within ±5%	±7½%	±10%	±20%
1	103	29	41	47	77
2	105	35	47	65	82
3	121	29	47	71	88
4	85	18	29	41	77
5	107	24	47	53	94
6	141	71	82	82	94
7	88	18	18	35	53
8	98	12	12	18	88
9	113	6	24	35	71
10	103	6	41	47	88
11	111	41	47	71	82
12	142	41	47	71	94
13	107	29	47	65	94
14	119	47	71	77	94
15	113	29	59	65	100
16	106	53	65	71	94
17	114	47	65	77	94
18	114	71	71	77	100
	Average	33.7	47.8	59.3	86.9

Table 19

SIZE OF CITY
5,000 - 10,000 - 7 RATERS

Consistency

Film No.	Arithmetic Mean Rating	Percent of Groupt Within			
		±5%	±7½%	±10%	±20%
1	109	43	57	71	71
2	115	0	57	57	86
3	113	29	43	57	86
4	99	43	43	57	71
5	122	29	43	43	86
6	139	43	43	43	86
7	98	29	29	29	57
8	105	29	29	29	57
9	109	71	71	71	100
10	113	29	43	71	71
11	124	29	29	57	86
12	135	29	43	71	86
13	121	57	57	71	86
14	122	29	71	71	86
15	123	57	57	71	86
16	115	29	57	71	86
17	125	71	71	86	100
18	122	71	86	86	100
	Average	39.8	51.6	61.8	82.6

Accuracy

Film No.	Corrected Mean Rating	Percent of Group Within			
		±5%	±7½%	±10%	±20%
1	105	43	57	57	71
2	107	43	43	57	86
3	123	14	29	29	71
4	91	29	29	43	71
5	114	0	14	43	86
6	150	43	43	43	71
7	91	0	14	29	43
8	102	14	29	29	57
9	117	14	43	71	86
10	107	29	43	57	71
11	115	43	57	57	86
12	147	29	43	57	86
13	116	29	71	71	86
14	128	29	29	29	86
15	122	57	57	71	86
16	112	43	57	86	86
17	121	57	86	86	100
18	121	71	86	86	100
	Average	32.6	46.1	55.6	79.4

Table 20

SIZE OF CITY
10,000 - 25,000 - 19 RATERS

Consistency

Film No.	Arithmetic Mean Rating	Percent of Group Within ±5%	±7½%	±10%	±20%
1	110	47	58	63	100
2	109	60	60	67	100
3	111	47	67	73	100
4	93	27	27	40	100
5	107	47	60	80	80
6	135	74	79	90	100
7	103	27	53	60	100
8	108	40	40	67	100
9	103	16	26	26	100
10	105	47	67	67	100
11	114	42	58	90	100
12	130	84	90	100	100
13	116	47	58	74	100
14	113	60	73	80	100
15	112	47	60	67	90
16	111	63	68	74	100
17	118	53	84	95	100
18	116	58	90	100	100
	Average	49.2	62.1	73.0	98.7

Accuracy

Film No.	Corrected Mean Rating	Percent of Group Within ±5%	±7½%	±10%	±20%
1	103	42	47	53	79
2	104	40	60	67	100
3	121	27	53	67	87
4	85	27	27	53	60
5	107	47	60	80	93
6	140	47	90	95	100
7	91	20	40	47	67
8	102	40	60	67	87
9	117	16	26	38	58
10	100	47	53	73	93
11	108	42	53	87	95
12	138	74	79	90	100
13	109	26	47	63	100
14	119	60	60	73	93
15	113	53	67	87	100
16	107	58	63	74	95
17	115	42	68	90	100
18	115	58	90	100	100
	Average	42.6	58.0	71.4	89.3

Table 21

SIZE OF CITY
25,000 - 50,000 - 10 RATERS

Consistency

Film No.	Arithmetic Mean Rating	Percent of Group Within ±5%	±7½%	±10%	±20%
1	113	60	60	70	100
2	114	60	80	100	100
3	106	70	80	80	100
4	95	40	50	60	80
5	114	70	70	70	100
6	136	60	80	90	100
7	97	70	80	90	100
8	111	70	80	80	100
9	97	60	70	80	100
10	115	50	70	70	100
11	118	70	80	90	100
12	133	60	90	90	100
13	116	20	70	70	100
14	112	50	80	80	90
15	113	40	50	50	100
16	111	50	60	80	100
17	116	70	90	90	100
18	113	50	60	90	100
	Average	56.7	72.7	79.4	98.3

Accuracy

Film No.	Corrected Mean Rating	Percent of Group Within ±5%	±7½%	±10%	±20%
1	104	0	20	60	90
2	105	40	50	60	100
3	122	10	20	30	90
4	87	30	30	40	80
5	109	50	60	80	100
6	144	50	60	80	100
7	88	20	40	60	90
8	99	40	40	40	90
9	114	10	10	40	80
10	104	40	60	80	80
11	112	50	70	80	90
12	144	30	50	70	100
13	108	40	60	60	80
14	119	50	50	80	90
15	113	40	50	50	100
16	106	50	70	80	90
17	114	70	80	90	100
18	114	60	80	80	100
	Average	37.8	50.0	64.4	91.7

Table 22

SIZE OF CITY
50,000 - 100,000 - 7 RATERS

Consistency

Film No.	Arithmetic Mean Rating	Percent of Group Within ±5%	±7½%	±10%	±20%
1	116	43	43	57	100
2	123	57	71	71	100
3	119	14	57	86	100
4	112	43	57	71	100
5	126	43	57	71	86
6	141	14	14	71	86
7	104	43	43	57	100
8	107	71	86	100	100
9	102	29	57	71	86
10	120	86	86	100	100
11	121	71	71	71	100
12	139	71	71	71	100
13	121	43	71	100	100
14	117	57	100	100	100
15	120	71	71	100	100
16	120	71	71	71	100
17	124	71	86	100	100
18	123	71	71	71	100
	Average	53.8	65.7	80.0	97.7

Accuracy

Film No.	Corrected Mean Rating	Percent of Group Within ±5%	±7½%	±10%	±20%
1	112	29	57	57	86
2	113	14	29	57	86
3	131	57	57	57	86
4	95	14	14	29	43
5	119	14	14	57	100
6	157	57	57	71	100
7	91	14	29	29	71
8	102	43	86	86	100
9	117	0	14	29	86
10	109	14	43	43	100
11	117	43	71	71	86
12	150	43	57	86	86
13	113	43	43	57	100
14	125	43	57	71	100
15	119	71	86	100	100
16	114	57	57	86	100
17	122	14	86	100	100
18	122	71	71	71	100
	Average	35.6	51.6	64.3	90.6

Table 23

SIZE OF CITY
MORE THAN 100,000 - 11 RATERS

Consistency

Film No.	Arithmetic Mean Rating	Percent of Group Within ±5%	±7½%	±10%	±20%
1	106	45	45	55	73
2	109	36	45	73	73
3	100	36	45	45	73
4	94	27	36	55	82
5	112	27	55	55	82
6	127	45	45	64	91
7	104	9	36	36	82
8	106	27	36	36	82
9	99	9	9	18	82
10	109	18	27	64	82
11	114	9	45	45	73
12	135	36	64	73	73
13	107	27	45	55	73
14	103	45	45	55	73
15	111	36	55	64	82
16	105	45	55	64	73
17	108	9	18	55	82
18	113	27	64	73	82
	Average	28.5	42.8	54.7	78.5

Accuracy

Film No.	Corrected Mean Rating	Percent of Group Within ±5%	±7½%	±10%	±20%
1	98	27	64	73	73
2	100	55	64	64	73
3	115	0	0	0	45
4	84	45	55	73	82
5	105	55	64	73	73
6	138	18	36	36	82
7	89	45	45	64	73
8	100	18	45	64	82
9	115	18	27	27	45
10	103	55	55	73	82
11	111	27	27	45	73
12	142	27	27	36	73
13	102	45	45	73	73
14	112	0	18	36	55
15	107	45	55	64	82
16	101	55	64	64	73
17	109	9	27	27	82
18	109	64	73	73	82
	Average	33.8	44.0	53.6	72.4

Table 24

RESULTS OF F TEST

Consistency

	Percent of Group Within					
	±5%		±7½%		±10%	
Parameter	F Value	Signif. Level	F Value	Signif. Level	F Value	Signif. Level
Experience	2.67	-		-	1.93	-
Concept of Standard		-	2.78	-	4.20	-
Initial Training	4.89	5%	15.25	1%	11.28	1%
Number of Employees	3.15	-	2.15	-		-
Area	5.43	1%	3.69	5%	7.05	1%
Size of City	6.82	1%	7.82	1%	7.60	1%

Accuracy

	Percent of Group Within					
	±5%		±7½%		±10%	
Parameter	F Value	Signif. Level	F Value	Signif. Level	F Value	Signif. Level
Experience		-		-	1.89	-
Concept of Standard	4.04	-	3.34	-	2.93	-
Initial Training	3.16	-	6.13	5%	10.65	1%
Number of Employees	1.45	-		-	2.06	-
Area		-		-	3.25	-
Size of City		-	1.05	-	2.11	-

EXPERIENCE, CONCEPT OF STANDARD, NUMBER OF EMPLOYEES have no significant differences between means at the 5 percent confidence level in either CONSISTENCY or ACCURACY.

TRAINING, only, has a significant difference between means at the 5 percent confidence level in ACCURACY.

Table 25

RESULTS OF FISHER t TEST

Confidence Level Between Pairs Of Menas

Consistency Only

	Percent of Group Within		
	±5%	±7½%	±10%
Initial Training			
Company vs. College*	5%	1%	1%
Area			
Michigan vs. Northern Midwest	1%	1%	1%
Michigan vs. Central Midwest	1%	-	1%
Michigan vs. Southern Midwest	1%	-	1%
All other pairs	-	-	-
Size of City			
Over 100,000 vs. 0-5,000	1%	1%	1%
Over 100,000 vs. 5-10,000	5%	-	-
Over 100,000 vs. 10-25,000	1%	1%	1%
Over 100,000 vs. 25-50,000	1%	1%	1%
Over 100,000 vs. 50-100,000	1%	1%	1%
5-10,000 vs. 10-25,000	-	5%	5%
5-10,000 vs. 25-50,000	1%	1%	1%
5-10,000 vs. 50-100,000	1%	1%	1%
0-5,000 vs. 25-50,000	5%	1%	-
All other pairs	-	-	-

*Significant difference between means at the 1 percent confidence level for ACCURACY also.

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